



Association Internationale de la Savonnerie, de la Détergence et des Produits d'Entretien
International Association for Soaps, Detergents and Maintenance Products

SCEDs

Specific Consumer Exposure determinants

A.I.S.E. supporting explanation

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1. Foreword

This document is issued by the A.I.S.E. SCEDs Task Force, which provided technical input for the SCEDs project.

The objective of the project is to describe key considerations underpinning **SCEDs (Specific Consumer Exposure Determinants)** and to develop a library **of SCEDs** that reflect the principal situations of use for consumer products formulated by the involved sectors. The SCEDs are intended to represent realistic, yet conservative, assumptions for consumer exposure assessments.

This document provides description and additional information in regards of the content of A.I.S.E. SCEDs to be used for consumer exposure assessment.

DISCLAIMER: This document has been prepared by A.I.S.E. It is made freely available to companies as supporting information for the use of Specific Consumer Exposure Determinants in the framework of chemical safety assessment. The proposed SCEDS are meant to be applied as a full dataset and cannot cover any deviation. The proposed guidance is offered in utmost good faith and the information it contains is believed to be correct. Its authors do not assume any liability for any inaccuracy or incompleteness found in the content. Neither do they assume liability for any use made of the guidance content or for companies' assessments.

2. Scope of SCEDs

The SCEDs are intended to be used in the evaluation of the potential risk to consumers derived from exposure to chemical substances as a consequence of intended use of A.I.S.E. products.

The SCEDs cover direct exposure following the intended use of the product only, not accidental exposure.

The SCEDs do not reflect a specific product, but cover all products within a category and the use of conservative defaults ensures that exposure is not underestimated.

Additional information can be found in the DUCC/CONCAWE guidance “Specific Consumer Exposure Determinants - How to use the SCEDs for chemical exposure assessment under REACH – Guidance for SCEDs user – DUCC/CONCAWE – April 2014”.¹

3. Product scope and definition

The intent of the SCEDs is to cover the main product categories in the A.I.S.E. portfolio.

The users of the SCEDs are responsible for identifying the appropriate category(ies) for their products.

At present, A.I.S.E. SCEDs are available for the following A.I.S.E. categories:

- Consumer use of Laundry products
- Consumer use of Fabric Conditioners
- Consumer use of surface cleaner– non-spray application
- Consumer use of Liquid surface cleaner– spray application
- Consumer use of machine dishwashing products
- Consumer use of Hand dishwashing liquid
- Consumer use of polishes and wax blends– Non Spray application
- Consumer use of polishes and wax blends – Spray application
- Consumer use of Air Care products – Non aerosol
- Consumer use of Air Care products – Aerosol

The information provided in the A.I.S.E. SCEDs includes:

- The concentration range of the substance category (not being substance specific) in each product type – A generic maximum is provided. See section 4.
- Habits and practices data for the product, such as dosage and form, frequency of use and duration of exposure. See section 5.
- The relevant routes of exposure. See section 6.
- The consideration given to adult and child exposure. See section 7.

More details are provided in the sections below.

¹ <http://www.ducc.eu/documents/20140424-Guidance%20documents%20on%20SCEDs-Final-V1.pdf>

4. Substance concentration in product

The use levels of individual chemicals in the various relevant classes of household detergent and cleaning products, e.g. laundry detergents; household cleaners, fabric softeners etc. must be identified and included in each specific substance evaluation. The A.I.S.E. SCEDs provide an indication of the maximum concentration of any ingredient present in the product. More specific information is available in the production composition subsection of the cleanright website: www.cleanright.eu. It is expected that the actual value of level of chemical in product will be known by the SCEDS user and utilised in the exposure calculation. Only in case the SCED user lacks such information, the generic, indicative maximum defaults are to be used.

5. Frequency of use, quantity of product, duration of exposure – Habits and practices

The information on frequency of use, product dosage, and exposure duration as proposed in the SCEDs is based on the work done within the HERA risk assessment project – www.heraproject.com

The exposure of consumers to a substance contained in a product is determined by the frequency and duration of use of the product and the concentration of the substance in the product. It is therefore necessary to gain an understanding of how a product is used by the consumer, and to establish the exposure route(s) of relevance to the consumer. HERA developed a database containing detailed quantitative and qualitative data on how the consumer uses products, called the Table of Habits and Practices. Such data are often referred to as habits and practices (H&P) data.

These include, but are not limited to, the concentration of the product in specific use scenarios; the duration of contact between the consumer and the product for each scenario described and the frequency of product use.

The aim is to understand how people actually use the product (e.g. how often and in what ways) in order to feed exposure parameters into the mathematical model of ECETOC TRA, version 3.1. The HERA habits and practices table compiles the best available information based on sector knowledge and experience. If no information is available 'default values' from ECETOC TRA are employed as conservative values.

The habits and practices table was based on information sent by the formulating companies to a nominated individual in A.I.S.E, in confidence, and a consolidated overview of all the exposure data was derived. Therefore, the integrated data-set is not commercially sensitive.

The overall HERA work as well as these habits and practices data were collected during the year 2000, peer-reviewed and published in the A.I.S.E website. The HERA methodology and risk assessments were reviewed by an External Advisory Panel of independent academic experts. In 2009, A.I.S.E. added habits and practices information on new products categories. The A.I.S.E. habits and practices table can be found in Appendix 1.

More recently A.I.S.E. started running a pan-European consumer survey every 3 years (2009, 2011, and 2014) and these data, where relevant, are used as supporting information confirming the validity of the HERA habits and practices database.

In addition, with regards to product dosage, A.I.S.E. has a long history of sustainability initiatives supporting ever more compact products. These initiatives have enabled our sector to compact their product and thus reduce the overall quantity of chemicals used. In the A.I.S.E. SCEDs, the amount of product that is applied is not based on the most compacted products therefore product dosage is considered very conservative.

Below are listed the initiatives and the supported dosages.

Name of the initiative	Product category	Dosage	Year
LSP-1	Household Solid laundry detergents	100 g/wash	2006-2007
LSP-2	Household Solid laundry detergents	85 g/wash	2009-2012
PREP-P3	Household Solid laundry detergents	75 g/wash	2012-2014
Charter	Household Solid laundry detergents	75 g/wash	As of 1/07/2012
LSP-L	Household Liquid laundry detergents	75 mL/wash	2009-2011
Charter	Household Liquid laundry detergents	75 mL/wash	As of 1/07/2010
Charter	Household Fabric conditioners	35 mL/wash	As of 1/07/2010
PREP-FC	Household Fabric conditioners	35 mL/wash	2012-2014
Charter	Household Dilutable All Purpose and Floor Cleaner	5 mL / 5 L of water	As of 1/10/2012
Charter	Household manual dishwashing detergents	12 mL / L of water	As of 1/01/2014

6. Relevant routes of exposure

The information provided in the A.I.S.E. SCEDs can be used to estimate the systemic exposure of consumers to a substance. In cases where consumer exposure does not occur or is negligible for a particular route, then it is proposed not to carry out an exposure assessment for that route.

The primary route of exposure for household detergent and cleaning products is the dermal route. Direct oral exposure does not occur during intended product use and the findings in the HERA risk assessments also showed that generally inhalation exposure was negligible when compared to dermal exposure for specific products. However, the degree of inhalation exposure is determined by the ingredients' vapour pressure, i.e. the contribution of substances with high vapour pressure may have to be considered for certain products. In fact, for air fresheners, inhalation exposure is the most important route of exposure (see chapter 7).

The SCEDs provide information on whether volatile ingredients contribute to the overall exposure via the inhalation route in a specific product category. As a very conservative approach, substances are considered volatile for this purpose if their vapour pressure exceeds 10 Pa, corresponding to the vapour pressure for which the ECETOC TRA tool assumes complete instantaneous release into the ambient air. For exposure assessments of such substances, the inhalation route should be included if indicated in the SCEDs. Further justification is given in Appendix 2.

7. Child and adult exposure

Consistent with the defined scope of SCEDS described in section 1.3 of the SCEDS General Guidance document “Specific Consumer Exposure Determinants - How to use the SCEDs for chemical exposure assessment under REACH – Guidance for SCEDs user – DUCC/CONCAWE – April 2014”, the A.I.S.E. SCEDs aim to cover direct consumer uses of laundry and cleaning and maintenance consumer products (referred to as A.I.S.E. products in this document). Application of A.I.S.E. products is performed by adults and the A.I.S.E. SCEDS therefore address direct adult consumer exposure. Notably, A.I.S.E. continues to actively promote the prevention of accidental child exposure to its products. For example, a set of safe use pictograms and instructions for safe use and storage of household cleaning products have been developed. More information is available at the A.I.S.E. website².

It is important to note that in the case of Air Care products, child exposure has been taken into consideration. This is because inhalation exposure will occur in both children and adults during the use of these products. A comparison was made between child inhalation exposure (derived using a more accurate and realistic higher tier model) and adult exposure calculated with the AISE SCEDs/ECETOC TRA tool, for both aerosol and non-aerosol Air Care products. The comparison was exemplified with d-limonene. It was assumed that d-limonene was present in both types of Air care products at 5%. The comparison showed that, due to the conservative nature of the SCEDs, adult exposure was 68-fold higher for non-aerosols and 2-fold higher for aerosols compared to child exposure. Therefore adult exposure estimations will be protective for children when the Air Care SCEDs are used. It should be noted that the calculation is applicable to all chemicals, not just d-limonene. Details of the calculations can be found in Appendix 3.

² <https://www.aise.eu/our-activities/information-to-end-users/consumer-activities.aspx>

References

DUCC/CONCAWE guidance - Specific Consumer Exposure Determinants - How to use the SCEDs for chemical exposure assessment under REACH – Guidance for SCEDs user – April 2014 – Available at: <http://www.ducc.eu/documents/20140424-Guidance%20documents%20on%20SCEDs-Final-V1.pdf>

Cleanright website – Product composition: Available at: www.cleanright.eu

HERA risk assessment project – www.heraproject.com

A.I.S.E. pan-European consumer survey. Available at:

https://www.aise.eu/documents/document/20171026152706-consumershabitssurvey_final_2015-def2_x_web.pdf

A.I.S.E. compaction initiatives – LSP and PREPs. Available at: <http://www.aise.eu/our-activities/sustainable-cleaning-78/product-resource-efficiency-projects.aspx>

A.I.S.E. Charter for sustainable cleaning. Available at: <http://www.sustainable-cleaning.com/en.home.orb>

A.I.S.E. safe use pictograms and instructions for household cleaning products have been developed. More information is available under A.I.S.E. website: <http://www.aise.eu/our-activities/information-to-end-users/consumer-activities.aspx>

ECETOC TRA - Available at: <http://www.ecetoc.org/tra>

ConsExpo – Available at: <http://www.rivm.nl/en/Topics/C/ConsExpo>

RIFM – Two Box Model – Available at: <http://www.rifm.org/events-detail.php?id=95#.VV2rLU-qoeM>

Appendix 1: A.I.S.E. / HERA Habits and practices

Developed by A.I.S.E. within the HERA project in 2002 and amended by A.I.S.E. with additional product categories in 2009.

TABLE OF HABITS AND PRACTICES FOR CONSUMER PRODUCTS IN WESTERN EUROPE

CATEGORY	Grams/Task			Use Frequency: # Tasks per week			Duration of Task			Other intended uses of category
	Min.	Max.	Typ.	Min	Max.	Typ.	Min.	Max.	Typ.	
LAUNDRY REGULAR										
Powder	55	290	150	1	18	5	Machine wash: < 1 min.			Laundry pretreatment: 10 min. / task,
Liquid	78	230	150	1,8	10	4	Hand wash (b): 10 min.			50-60% paste (powder); neat liquid
LAUNDRY COMPACT										
Powder	20	200	75	1	21	5	Machine wash: < 1 min.			Laundry pretreatment: 10 min. / task,
Liquid/gel	40	140	90	2,8	10	4	Hand wash (b): 10 min.			50-60% paste (powder); neat liquid
Tablet	45	135	90	3	10	4				
FABRIC CONDITIONERS										
Liquid Regular	50	140	135	3,3	10	4	Machine: < 1 min.			Not applicable
Liquid Concentrate	11	90	44				Hand wash (b): 10 min.			
LAUNDRY ADDITIVES										
Powder Bleach	50	70	60				Machine: < 1 min.			
Liquid Bleach (ml)	40	100	70	1,5	4	3	Hand wash (b): 5 - 10 min.			Laundry pretreatment liquid (neat)
Tablet	20	30	25							
HAND DISHWASHING										
Liquid Regular (a)	3	10	--	3	21	14	10	45	30	Not applicable
Liquid Concentrate (a)	2	5	--				10	45	30	
MACHINE DISHWASHING										
Powder	20	46	--							
Liquid	20	40	--	3	7	5		< 1 min.		Not applicable
Tablet	20	50	--							
CATEGORY										
				Use Frequency:			Duration of Task			Other intended

	Grams/Task			# Tasks per week						uses of category
	Min.	Max.	Typ.	Min	Max.	Typ.	Min.	Max.	Typ.	
SURFACE CLEANERS										
Liquid (a)	30	110	60							
Powder (a)	20	40	--	1	7	2	10	20	--	Not applicable
Gel (neat)	20	40	--							
Spray (neat)	5	30	--				2	10	--	
TOILET CLEANERS										
Powder	15	30	20							
Liquid (ml)			30	1	2	1		< 1 min.		Not applicable
Gel	20	35	25							
Tablet	25	50	35							
LAUNDRY AIDS										
Ironing Aids	1	20	10	1	5	2	5	20	60	
INSECTICIDES										
Liquid Electric	0,4	0,6	0,5	5,5	5,7	5,6	7,6	8,6	8,1	Units are grams/day in first column
Spray (neat)	9,5	10,75	10,1	2,5	2,7	2,6	3,9	4,4	4,2	
WATER SOFTENERS										
Powder (a)	22	88	44	1	4,5	2	<1min			
Liquids (ml)	50	83	60	1	4,5	2	<1min			
Tabs(tab)	1tab	1tab	1tab	1	4,5	2	<1min			
MAINTENANCE PRODUCTS										Furniture care, shoes, leather.
Spray	2	60	30	1	3	1	5	60	20	
WIPES										
Bathroom			1g			7	1	10	5	based on a total w/w of 7g
Kitchen			1g			3,5	2	10	5	based on total w/w of 7g
Floor			26g			2	2	10	5	Wet weight not determined
DRAIN GRANULES	70	70	70	0	1	<1	5	15	10	Single Unit
HIGH PRESSURE WASHERS/CLEANER	1,16	320,83	50	0,02	1	0,23	60	600	300	Use frequency counted on a year
AUTOMOTIVE CARE (SPRAY/LIQUID)	50	500	200	0,02	2	0,5	200	600	300	Use frequency counted on a year
AIR FRESHENERS										
1. Aerosol i) aqueous	1	1.8	1.4	1	37	8	1	15	6	
1. Aerosol ii) non-Aqueous	0.6	1.5	0.9	1	37	7	1	15	6	
2. Perfume in/on solid substrate (gel)	1.3 E-6	8.1 E-5	2.9 E-5	Continuous			Continuous			
3. Diffusers (heated+ electrical)	6.9 E-6	1.4 E-5	1.2 E-5	1	7	3,5	Continuous			

Additional data required to estimate adult exposure to air freshener ingredients

References shown in square brackets []

Sentinel (most conservative) scenarios for each product are shown in bold.

Air freshener product	Room of use	Volume associated with room	Air changes (ventilation rate) for room	Duration of exposure	Activity level associated with room	Breathing rate associated with activity level
Aerosol spray	Toilet [A]	2.5m³ (2500L) [B]	2/ hour [B]	15 mins/day [C]	Resting [C]	0.54m³/ hour [D]
	Bathroom [A]	10m ³ (10000L) [B]	2/ hour [B]	54 mins/day [A]	Resting [C]	0.54m ³ / hour [D]
Gels	Toilet [A]	2.5m³ (2500L) [B]	2/ hour [B]	15 mins/day [C]	Resting [C]	0.54m³/ hour [D]
Electric diffuser	Living room [A]	58 m³ (58000L) [B]	0.5/ hour [B]	240 mins/day [A]	Resting [C]	0.54m³/ hour [D]
	Kitchen [A]	15m ³ (15000L) [B]	2.5/ hour [B]	120 mins/day [A]	Resting [C]	0.54m ³ / hour [D]
Passive diffuser	Car [C]	2.6 m³ (2600L) [E]	1.6/ hour [E]	120 mins/day [C]	Resting [C]	0.54m³/ hour [D]
	Toilet [A]	2.5m ³ (2500L) [B]	2/ hour [B]	15 mins/day [C]	Resting [C]	0.54m ³ / hour [D]

References Appendix 1:

(a) per 5 l of wash water volume

(b) 0.1 – 1 % wash solution

Min= Minimum value / Max= Maximum value / Typ = typical value

[A] Exposure and Risk Assessment of Air Fresheners. Final Report. Torfs *et al.*, June 2008.

[B] RIVM report 320104002/2006. General Fact Sheet . Bremmer et al 2006

[C] Assumption based on industry experience.

[D] Guidance on information requirements and chemical safety assessments. Chapter R.15: Consumer Exposure estimation. ECHA May 2008

[E] Air change rates of motor vehicles and in-vehicle pollutant concentrations from secondhand smoke. J. of Exposure Science and Environmental Epidemiology (2008) 18, 312–325; Ott *et al.* 2008

Appendix 2: Relevance of inhalation route when assessing consumer exposure to household detergent and cleaning products via ECETOC TRA.

The following rationale supports that for substances of low volatility inhalation is a minor exposure route for consumers using household detergent and cleaning products. It shows that this is especially the case when the inhalation exposure is compared to the dermal exposure values estimated by the ECETOC TRA, given the much exaggerated assumptions used by the TRA tool.

The exercise was done by comparing inhalation exposure from powder detergent, liquid detergent and hand dishwashing products (estimated by using the ConsExpo model) to dermal exposure of these products (estimated using the ECETOC TRA). ConsExpo 4.1 was selected because it is a higher tier model which provides a more refined and realistic estimate of inhalation exposure than the TRA.

Exposure to substances in laundry dust:

Under normal exposure conditions, modern detergent powders produce very low levels of dust and consequently inhalation exposure is considered unlikely (1). HERA exposure assessments have also demonstrated that inhalation exposure to powder detergent during laundry washing is negligible (2, 3). Van de Plassche et al (1998 & 1999) reported an average release of approximately 0.27 µg of total dust per cup of product used for machine laundering (4) which was subsequently cited in several reports (1, 2, 3, 5, 6).

The RIVM exposure model, ConsExpo 4.1 was used to determine consumer exposure to laundry dust (i.e. no specific ingredient but total product, corresponding to weight fraction 1). It should be noted that of the 3 exposure scenarios for this product (Loading, Application, & Post-Application), inhalation exposure is only considered relevant to the Loading phase (filling the washing machine with powder). The model assumes that the entire 0.27 µg dust is released in a 1 m³ cloud around the consumer's head, which is then inhaled for a brief period of time. Using this model, systemic consumer exposure was calculated to be **2.5E-8 mg/kg bwt.**

Consumer dermal exposure was determined using the ECETOC TRA v.3 (applying SCEDs parameters). It should be noted that the model only determines exposure via the inhalation and dermal routes for this product. Dermal exposure was calculated to be **143 mg/kg bwt.**

Inhalation exposure to laundry dust estimated by ConsExpo was expressed as a percentage of dermal exposure estimated by ECETOC TRA:

$$(2.49E-8 \div 143) \times 100 = 0.000000017\%$$

These calculations show that inhalation exposure to laundry dust is negligible, particularly when compared to the conservative dermal exposure estimates derived using the ECETOC TRA.

Exposure to substances in liquid detergents and hand dish washing products:

Inhalation exposure could also occur from breathing in substances evaporating from liquid products as liquid laundry detergents or hand dishwashing products. As vapour pressure of ingredients can vary over a wide range in these products, three substances of differing volatility, i.e. linear alkylbenzene sulphonate (LAS), heptanol and ethanol, were used for exposure assessment. Inhalation exposure was determined using ConsExpo 4.1 based on phys.-chem. data obtained from either the HERA environmental risk assessment (7) or the corresponding REACH registration dossiers on the ECHA dissemination site (8). The amount of LAS and ethanol in the product was based on information from RIVM for this product type (5), the amount of heptanol (an ingredient not usually present in these products) was considered to be the same as that of ethanol.

It should be noted that of the 3 exposure scenarios for these products (Loading, Application, & Post-Application), inhalation exposure is only considered relevant to the Loading phase (filling the washing machine) in the case of liquid laundry product; and to the Loading phase (dilute product with water in the sink) and Application phase in the case of the hand dishwashing product. For liquid laundry products, ConsExpo assumes the substance evaporates from a 1 litre bottle and is present in a 1 m³ cloud around the consumer's head, which is then inhaled for a brief period of time. For hand dishwashing products the most relevant scenario is the Application phase, for which ConsExpo assumes evaporation from the surface of the sink that has a default value of 0.15 m². The substance is released to a kitchen with a room size of 15 m³, and exposure takes place in this room for 60 minutes.

Consumer dermal exposure was determined using the ECETOC TRA v.3 (applying SCEDs parameters).

Comparison of dermal and inhalation exposure: Dermal and inhalation exposure is calculated for ingredients of different vapour pressure and for different product categories. ECETOC TRA is used to assess the dermal route while the inhalation route is calculated with ConsExpo 4.1.

	LAS	Heptanol	Ethanol
CAS	68411-30-3	111-70-6	64-17-5
Molecular weight (g/mol)	342	116	46
Vapour pressure (Pa)	1E-12	70	5730
KOW (10log)	3.32	2.2	- 0.35
Liquid detergent			
Weight fraction	0.25	0.15	0.15
Dermal (TRA) (mg/kg/day) ⁽¹⁾	35.7	21.4	21.4
Inhalation (ConsExpo) (mg/kg/day) ⁽²⁾	1.8E-15	0.095	5.3
Ratio Inhalation/Dermal x 100 (%)	5E-15	0.5	25
Dish wash			
Weight fraction	0.30	0.10	0.10
Dermal (TRA) (mg/kg/day) ⁽¹⁾	85.8	28.6	28.6
Inhalation (ConsExpo) (mg/kg/day) ⁽³⁾	4.8E-15	0.002	0.083
Ratio Inhalation/Dermal x 100 (%)	5.5E-15	6.8E-3	0.29

(1) Calculated using SCEDS parameter

(2) Calculated using default ConsExpo parameters, inhalation chronic (internal) dose of *Mixing & Loading* scenario

(3) Calculated using default ConsExpo parameters, sum of inhalation chronic (internal) dose of *Mixing & Loading* and *Application* scenario

Conclusions:

The calculations above demonstrate that in general inhalation exposure is expected to be minimal when compared to dermal exposure estimated by ECETOC TRA (given the exaggerated assumptions used). Only for volatile substances in liquid laundry and fabric conditioners products, estimation of inhalation exposure has to be considered by using higher tier models such as ConsExpo. As a conservative threshold, a substance is considered as “volatile” in this context when it has a vapour pressure of 10 Pa, corresponding to the vapour pressure value for which TRA assumes complete instantaneous release into the ambient air.

References Appendix 2:

- 1) REACH Exposure Scenario Exemplification. AISE Case Study Final Report. March 2007, page 18/89.
- 2) HERA Risk Assessment of Alcohol Ethoxysulphates, AES DRAFT. January 2003.
- 3) HERA Risk Assessment of Isoeugenol (4-Hydroxy-3-methoxy-1-propen-1-yl benzene) CAS 97-54-1 DRAFT. Feb 2005.
- 4) Van de Plassche et al. (Nov 1998 & May 1999). Exploratory Report. Fluorescent Whitening Agents (FWAs). Moret Ernst & Young Management Consultants. Page 21.
- 5) RIVM Cleaning Products Fact Sheet. Prud’homme de Lodder et al 2006. RIVM Report no. 320104003/2006.
- 6) Exposure and Risk Screening Methods for Consumer Product Ingredients. The Soap and Detergent Association, Washington DC, April 2005. Page II-A-10.
- 7) Environmental Risk Assessment, LAS, Linear Alkylbenzene Sulphonate (CAS No. 68411-30-3). Revised environmental Aspect of the HERA Report, February 2013.
<http://www.heraproject.com/RiskAssessment.cfm>
- 8) ECHA Homepage: <http://echa.europa.eu/web/guest/home>

Appendix 3: Child exposure for air fresheners

Child inhalation exposure was determined using the higher-tier RIFM two box model [1]. The products assessed were a plug-in air freshener and an aerosol air freshener to represent non-aerosol and aerosols, respectively. Both products contained 5% d-limonene. The Input parameters and child exposure values are summarised below. Child inhalation exposure to d-limonene was 0.00291 mg/kg bwt (non-aerosol) and 0.145 mg/kg bwt (aerosol). Adult inhalation exposure was also derived using the SCEDs in the ECETOC TRA [2] for the same level of fragrance (shown below). In this case, adult exposure was 0.197 mg/kg bwt (non-aerosol) and 0.248 mg/kg bwt (aerosol).

Child exposure to d-limonene in Plug-in & Aerosol Air Freshener, using the RIFM 2-box model

Please note that all input parameters are product-specific default values in the 2-box model, unless specified otherwise.

Child exposure to d-limonene plug-in

Product: Plug-In

Product Used: 1000.0 mg/day

Material in Plug-In: 5.0% d-limonene (value used in TRA adult exposure estimation)

Minutes Used: 864.0 min/day

Two-Box Model Info

Zone 1 Volume: 15.0 m³

Zone 2 Volume: 183.5 m³

Air Flow (1 -> Outside): 0.15 m³/min

Air Flow (2 -> Outside): 1.84 m³/min

Air Flow (1 -> 2): 0.93 m³/min

Time in Zone 1: 42.0 min

Time in Zone 2: 1062.0 min

Inhalation Model Info

Body Weight: 10.0 kg*

Inhalation Rate: 2.1 L/min**

Computational Settings

Initial Zone 1 Concentration: 0.0 mg/m³

SCEDs supporting explanation

Initial Zone 2 Concentration: 0.0 mg/m³

Time Step: 1.0 min

Exposure Duration: 1440.0 min

RESULTS SUMMARY

Zone 1 Peak Concentration: 0.0452 mg/m³

Zone 2 Peak Concentration: 0.0152 mg/m³

Peak Exposure Rate: 6.894E-5 mg/min

Total Cumulative Exposure: 0.0291 mg

Total Exposure/Body Weight: 0.00291 mg/kg

Child exposure to d-limonene aerosol air freshener

Product: Spray

Spray Rate: 1.5 g/sec

Daily Use: 6.5 sec/day

Fragrance in Aerosol: 100.0%

Material in Fragrance: 5.0% d-limonene (value used in TRA adult exposure estimation)

Emission Duration: 1.0 min

Two-Box Model Info

Zone 1 Volume: 10.0 m³

Zone 2 Volume: 188.5 m³

Air Flow (1 -> Outside): 0.1 m³/min

Air Flow (2 -> Outside): 1.89 m³/min

Air Flow (1 -> 2): 0.87 m³/min

Time in Zone 1: 36.0 min

Time in Zone 2: 1068.0 min

Inhalation Model Info

SCEDs supporting explanation

Body Weight: 10.0 kg*

Inhalation Rate: 2.1 L/min**

Computational Settings

Initial Zone 1 Concentration: 0.0 mg/m³

Initial Zone 2 Concentration: 0.0 mg/m³

Time Step: 1.0 min

Exposure Duration: 1440.0 min

RESULTS SUMMARY

Zone 1 Peak Concentration: 48.75 mg/m³

Zone 2 Peak Concentration: 1.741mg/m³

Peak Exposure Rate: 0.102 mg/min

Total Cumulative Exposure: 1.45 mg

Total Exposure/Body Weight: 0.145 mg/kg

* This is the child bodyweight used in the ECETOC TRA and is representative of a 1.5-3 year old child (Table 17, RIVM General Fact Sheet, report 320104002/2006).

** Equivalent to 3m³/day. Value represents short-term respiration volume for a 1-3 year old child at rest. Value obtained from Table R.15-15 in REACh TGD Chapter R.15: Consumer exposure estimation. Version 2.1, October 2012.

Note that dermal exposure was not calculated for children. This is because for Air Fresheners in the ECETOC TRA, dermal exposure for adults is estimated only for Continuous action products. This is to represent potential dermal exposure occurring during product assembly, which is not relevant to children.

Determination of adult inhalation exposure to d-limonene in Air care products using the SCEDs and ECETOC TRA

Data for d-limonene:

Vp at 20C: 190 Pa (so fraction to air is 1)

Molecular weight: 136

Level of d-limonene in product: 5%

	Product Ingredient (g/g)	Amount Product Used per Application (g/event)	Frequency of Use (events / day)	Fraction Released to Air (g/g)	Dilution Fraction (unitless)	Exposure Time (hr)	Inhalation Rate (m ³ /hr)	Conversion Factor	Room Volume (m ³)	Body Weight (kg)	Inhalation Exposure
	(PI x	A x	FQ x	F x	DF x	ET x	IR x	1000)	/ (V x	BW)	Adult (mg/kg/d)
Aircare, instant action (aerosol sprays):	0.05	10	4	1	0.870	0.25	1.371	1000	20	60	0.497
Aircare, continuous action (solid & liquid):	0.05	50	1	1	0.172	8	1.371	1000	20	60	3.939
SCEDs: Aerosol			2								0.248
SCEDs: Non-Aerosol		2.5									0.197

References Appendix 3:

[1] RIFM – Two Box Model – Available at: <http://www.rifm.org/events-detail.php?id=95#.VV2rLU-qoeM>

[2] ECETOC TRA - Available at: <http://www.ecetoc.org/tra>